

**Commonwealth of Massachusetts
Office of Consumer Affairs & Business Regulation
Division of Energy Resources**

**RENEWABLE ENERGY PORTFOLIO STANDARD
ADVISORY RULING**

**FOR
BIOMASS ENERGY RESOURCE CENTER'S PROPOSED
BIOMASS GASIFIER DEMONSTRATION PROJECT**

August 4, 2004

1. Advisory Ruling Request by the Biomass Energy Resource Center

Biomass Energy Resource Center ("BERC") has requested that the Massachusetts Division of Energy Resources ("DOER" or "the Division") provide an Advisory Ruling with regard to the qualification under the Massachusetts Renewable Energy Portfolio Standard (RPS) of a proposed biomass gasifier demonstration project at Heyes Forest Products in Orange, Massachusetts.¹ This document is DOER's response to that request.

The RPS regulations, at 225 CMR 14.06(5),² provide an opportunity for a Generation Unit owner or developer "to request an advisory ruling from the Division to determine whether a Generation Unit would qualify as a New Renewable Generation Unit."³

2. Description of the Proposed BERC Project

The request from BERC concerns a proposed demonstration project at Heyes Forest Products ("Heyes"), namely for a small biomass gasifier that would supply "producer gas" to a diesel generator set, in which that gas would be co-fired with fossil diesel for combined heat and power (CHP) production. The initial electricity generating capacity of the system would be 150 kWe, with the potential to upgrade to 300 kWe.

Fossil diesel does *not* qualify as an Eligible New Renewable Fuel under the definitions at 14.02. Therefore, in order for the proposed system to receive a RPS Statement of Qualification, a Co-Firing with Ineligible Fuels Waiver would be required, as provided at 14.05(3). Further, the project would be subject to the more stringent provision at 14.05(3)(b) for co-firing when the Eligible New Renewable Fuel is an Eligible Biomass Fuel, namely that "the entire Generation Unit must meet the requirements of a low emission, advanced biomass power conversion technology as set forth in 225 CMR 14.05 (1) (a) 6."

This Advisory Ruling will address the proposed project's fuels, technology, and air emissions.

¹ The BERC request was provided as an email letter to Howard Bernstein at DOER, dated May 3, 2004. In addition to the 5/3/04 letter, technical information was provided in a 6/28/04 email message that responded to questions posed by DOER. The 5/3/04 letter describes Heyes as "a vertically-integrated sawmill and dry kiln business."

² Hereafter, all references to the RPS regulations will be to sections of 225 CMR 14.00.

³ More information about Advisory Rulings for MA RPS is at <http://www.mass.gov/doer/rps/advisory.htm>.

3. Discussion of the Proposed Fuels

The gasifier would use wood chips from the operations of forestry, sawmills, and other wood products businesses. It might additionally consume “larger-sized chips” or briquettes made from woody debris of such operations. Both types of woody debris or woody debris-derived fuels, as well as the producer gas derived from them by the gasifier, are qualified as Eligible Biomass Fuels under the RPS regulations at 14.02.

In addition to the wood-derived producer gas, BERC intends to use between 20% and 50% (on a heat content basis) fossil diesel as a supplementary fuel, “in order to assure efficient and even burning of the producer gas which is critical for genset performance.”⁴ Although fossil diesel fuel does *not* qualify as an Eligible New Renewable Fuel under the definitions at 14.02, the Unit can receive a Statement of Qualification under the Co-Firing with Ineligible Fuels Waiver provided at 14.05(3). Under that section of the regulations, only the portion of the total electricity output that is attributable to the RPS-qualified fuel would qualify as New Renewable Generation, as detailed at 14.05(3)(a). BERC has stated its intention “to implement a procedure that can accurately calculate the kWe from producer gas versus the kWe produced by ineligible fuel.”⁵

4. Discussion of the Proposed Biomass Gasification Technology

The RPS regulations at 14.05(1)(a)6 provide that the qualification of biomass Generation Units is limited to “low-emission, advanced biomass power conversion technologies using an Eligible Biomass Fuel.” These criteria are designed to insure that the RPS provides incentives for older, dirtier technologies to be replaced by cleaner and more efficient technologies. DOER also believes that biomass technologies should improve over time in response to the incentives created by the RPS, added to the other regulatory and market forces responsible for continued technological progress in the electricity generation sector generally.

The technology proposed for this project is described as

a downdraft biomass gasifier manufactured in India by Ankur Scientific Energy Technologies Pvt. Ltd. . . . [which] . . . has been further modified by the Center for Biomass Utilization at the Energy and Environmental Research Center (EERC), located at the University of North Dakota, to accommodate the standard-sized wood chips produced in the U.S.⁶

The Ankur downdraft design, including a reduction bed control system, ensures a breaking down and combustion of the tars, which results in both more energy extraction and a product gas clean enough to be used in an engine. Thus, this project is expected to provide a demonstration of an innovative technology for the use of one of the region's most abundant and important biomass fuels, or, as BERC's 5/3/04 letter states:

The use of wood gasification technology to produce combined heat and power in a small-scale commercial setting has not yet been successfully demonstrated in the United States. Once proven, this technology offers improvements in fuel efficiency as well as the potential of lower costs and better environmental performance than conventional heating oil or wood combustion. Woodgas also has the potential of being used in advanced energy conversion devices such as micro turbines and fuel cells.

⁴ 6/28/04 email.

⁵ Ibid.

⁶ 5/3/04 letter.

The electricity generating engine currently planned for use is “a Caterpillar DM5490 generator set or a similarly configured commercial engine,” with dual fuel capability. The fuel likely to be co-fired with the producer gas is fossil diesel. The flow of producer gas from the gasifier would remain steady, while the flow of diesel would be modulated to respond to the changing electricity demand of the sawmill's operation, which can include load surges requiring instantaneous power in response.⁷

DOER believes that the demonstration of this gasification technology would, if successful, advance the technology for deriving electricity from biomass beyond its current level. Such advances are the desired outcome both of the statute and of the regulations for RPS (at 14.05(1)(a)6) in requiring that biomass units utilize “low-emission, advanced biomass power conversion technologies.”

Accordingly, although the generator set itself is conventional, off-the-shelf equipment, DOER expects to determine that the proposed Generation Unit as a whole system meets the “advanced technology” criterion of the RPS regulations, based on the description of the gasifier system provided in BERC's letter (pending any further details submitted with an eventual Statement of Qualification Application), and also based on the potential demonstration value of this project.

5. Discussion of the Project's Air Emissions

The proposed project can be qualified for RPS only under the Co-Firing with Ineligible Fuels Waiver at 14.05(3), including the more stringent provision at 14.05(3)(b) for Generation Units that co-fire an Eligible Biomass Fuel with an ineligible fuel, namely that “the entire Generation Unit must meet the requirements of a low emission, advanced biomass power conversion as set forth in 225 CMR 14.05 (1) (a) 6.” The low emission criterion does not set specific emission targets. Rather, the threshold for eligibility is expected to become more stringent as biomass energy conversion and emission control technologies improve. In addition, that threshold might differ among fuels, technologies, project scale, and site-specific conditions – as determined by the Massachusetts Department of Environmental Protection (MA DEP).

Under the RPS regulations at 14.05(1)(a)6.a, a generator must receive a valid air permit from its appropriate state air quality regulatory agency to qualify as an eligible biomass generator. The same subsection also provides that the project “must . . . demonstrate to the satisfaction of the Division that its emission rates are consistent with emission rates for comparable biomass units as prescribed by the Massachusetts Department of Environmental Protection.”⁸ In the case of a project located in Massachusetts, a Valid Air Permit issued by the MA DEP will meet the RPS requirement of satisfactory demonstration.⁹

⁷ 5/3/04 letter and 6/28/04 email.

⁸ If the air quality regulations applicable in the jurisdiction where the unit is located do not require an air permit, then the unit must satisfy the requirements of the RPS regulations at 14.05(1)(a)6.c, which provides that the Unit “must demonstrate to the satisfaction of the Division that its emission rates are consistent with emission rates for comparable biomass units in a manner described in the [RPS] Guidelines.” However, this is not expected to apply to the project proposed here.

⁹ It must be noted that the only previous Advisory Ruling for a plant that may co-fire an Eligible Biomass Fuel with an ineligible fuel was the Advisory Ruling for Schiller Station (at <http://www.mass.gov/doer/rps/comschil.htm>). In the case of Schiller, DOER provided that the air emissions if and when the plant were to co-fire coal with biomass, must not exceed the limits pertaining to the use of wood alone in order for the plant to retain its RPS qualification. DOER does not intend to apply that standard in the present case, for three reasons. First, the use of coal for Schiller would be made solely on price and supply grounds—an economic choice—while its use is technically necessary for the unit at Heyes. Second, this is a small demonstration project (150-300 kW) with low-sulfur diesel as the ineligible fuel, resulting in a very much smaller increment of pollution than would occur if Schiller (50 MW) were to co-fire with coal. Third,

Based on current information, the current project would require a Valid Air Permit from the MA DEP under the Comprehensive Plan Application (CPA) provision for internal combustion engines, which matches BERC's expectation, as expressed in its 6/28/04 email:

Our team will be testing the emissions of the generation unit (gasifier and gen-set) outside of Massachusetts prior to the construction of the gasifier at Heyes. We expect the results of this testing to provide a basis for our Comprehensive Plan Application to DEP.

In addition, DOER notes that the DEP has proposed amendments to its regulations (at 310 CMR 7.00 and 310 CMR 70.00) to establish new performance standards and permit thresholds for engines and turbines.¹⁰ Under the provisions of the public hearing draft of those amendments, filing a CPA is an alternative to certifying to the performance standards in the regulation for an engine that will burn biogas.

In any case, with or without enactment of the proposed amendments, Best Available Control Technology (BACT) would be required as a condition of a Comprehensive Plan approval for this project. The DEP has described its views on BACT determination for the BERC project as follows:

As part of determining BACT, the DEP can consider many factors, including that this proposal includes utilization of innovative technology. The DEP agrees with DOER that gasification to provide fuel to an internal combustion engine holds significant promise for reduced emissions and increased energy efficiency, when compared with conventional technologies.¹¹

DOER appreciates the DEP's shared interest in the implementation of this innovative project. In conclusion, assuming that the project will receive a Valid Air Permit from the MA DEP, DOER will find that the project meets the required low emissions criterion. As a demonstration project, however, DOER intends that it not necessarily set precedent for subsequent projects that co-fire biomass gasification product gas with fossil diesel in a reciprocating engine with combined heat and power. Only after the performance and air emissions of this project are monitored and evaluated can DOER consider the eligibility of subsequent, comparable projects. This is the same approach DOER used in its 5/11/04 Advisory Ruling on ABCDC's biodiesel CHP project in Boston, except that the ABCDC project fell below the DEP's air permitting threshold.¹²

6. Summary of Ruling

DOER has found Biomass Energy Resource Center's proposed biomass gasification project, as currently described, to fall within the eligibility criteria for biomass co-fired New Renewable Generation Units, provided in the RPS regulations at 14.05(3) and 14.05(1)(a)6, although qualifying under low-emissions criterion will be contingent upon successfully meeting the air permitting standards of the MA DEP, as discussed above. The following summarizes this finding, and it also notes several key issues and requirements for BERC to consider in its project planning. In reviewing an eventual Statement of Qualification Application, DOER will also consider these issues and requirements.

DOER believes that this project will demonstrate a gasification technology that would, if successful, advance the technology for deriving electricity from biomass beyond its current level.

¹⁰ The proposed regulations may be viewed in the May section of this web page: <http://www.mass.gov/dep/new.htm>.

¹¹ Email from Don Squires, MA DEP, to Howard Bernstein, DOER, dated 8/4/04.

¹² The ABCDC Advisory Ruling can be accessed via a link from this URL: <http://www.mass.gov/doer/rps/advisory.htm>.

1. DOER finds the proposed biomass fuels to be consistent with the definition of Eligible Biomass Fuels in the RPS regulations. The gasifier fuels will consist of, or derive from, wood chips from forestry, sawmill and other wood products operations. However, because of the proposed dual use of the resulting wood gas with fossil diesel in a diesel generation set, any Statement of Qualification would be granted under the Co-Firing with Ineligible Fuels Waiver provided at 14.05(3).
2. DOER finds, pending any additional or differing details to be submitted with a Statement of Qualification Application, that the planned downdraft gasifier technology would qualify the entire Generation Unit, including the diesel generation set, as an advanced biomass power conversion technology. The use of an Ankur gasifier technology with biomass, one of our state's most important renewable fuels, should provide a valuable demonstration of its potential use for small-scale power generation and CHP and could advanced the technology for biomass utilization.
3. DOER will find that the project meets the required low emissions criterion on the condition that project receives a Valid Air Permit from the MA DEP. As a demonstration project, however, DOER intends that it not necessarily set precedent regarding the emissions of subsequent projects that co-fire biomass gasification product gas with fossil diesel in a reciprocating engine with combined heat and power. DOER advises BERC to maintain communication with the MA DEP as it proceeds with project development.
4. BERC should note that, while DOER may grant a Statement of Qualification for the proposed Generation Unit, the RPS qualification of the plant always would be contingent on the plant's operating in compliance both with its MA DEP permit(s) and with DOER's RPS regulations, including any conditions in the plant's RPS Statement of Qualification.
5. Finally, BERC should note that, once DOER grants a Statement of Qualification, further advances in "low-emission, biomass power conversion technologies" or DOER's decisions on comparable co-firing projects would have no effect on the plant's MA RPS qualification.